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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,390	06/09/2006	Michael D. Craven	30794104USWO	3883

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EXAMINER

FOX, BRANDON C

ART UNIT	PAPER NUMBER
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2818

MAIL DATE	DELIVERY MODE
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10/17/2011

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/582,390	Applicant(s) CRAVEN ET AL.	
	Examiner BRANDON FOX	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 June 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1,6,7,9-19 and 24-36 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1,6,7,9-19 and 24-36 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/17/2011</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

This is a Non-Final Office action based on application 10/582,390 in response to reply filed June 2, 2010. Claims 1, 6-7, 9-19, 24-36 are currently pending and have been considered below.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 25, 2010 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6, 9, 10, 11-15, 17-19, 24-28, & 31-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski (WIPO Publication 03/098757) with Dwilinski (Pre-Grant 2006/0138431) provide as an English translation in view of Takeuchi (US Patent 6,229,151).

Regarding claims 1, 6, 9, 10, 11 & 25, Dwilinski discloses a light emitting device comprising:

- Epitaxially growing a GaN layer (Fig. 1, 24 & Paragraph [0076]) on a substrate, wherein Dwilinski discloses the layers are grown from a non-polar A-plane face of the substrate (See Paragraphs [0016] & [0109]) therefore the GaN layer will also have the non-polar A- plane growth surface.
- Dwilinski further discloses growing an InGaN or InAlGaN quantum well layer (3) directly off of the GaN layers and also exhibit the non-polar A-plane growth configuration (See Claim 10).

Dwilinski does not expressly disclose the quantum well width required for optimal emission is larger for the A-plane than for a polar C-plane quantum well.

However Takeuchi disclose a light emitting device comprising:

- Forming several layers to make up a light emitting device including, a n-type & p-type GaN contact layer, n-type & p-type AlGaIn cladding layer, and a multiple quantum well all grown on a sapphire substrate (See Col 4, Lines 1-4), wherein the present invention grows the layers at a plane that is 90° from the polar C-plane, such as the A-plane (See Col. 3, Lines 7-10).
- Takeuchi further discloses, in Fig. 6, the emission efficiency of the present invention grown having an orientation such as the A-plane and that of a

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conventional device grown on the {0001} plane (also known as the C-plane), wherein plot line A shows that the non-polar A-plane quantum well has a higher emission efficiency at larger quantum well widths than the polar C-plane quantum well shown at plot line B.

It would have been obvious to those having ordinary skill in the art at the time of invention to incorporate the teachings of Takeuchi with that of Dwilinski because by growing the layers having the A-plane orientation will minimize the piezoelectric field in the quantum well and thereby will increase the efficiency of light generation of the quantum well (See Col 2, Lines 51-55 & Col. 4, Lines 25-34).

Regarding claim 7, Dwilinski further discloses:

- The growing steps comprises placing wafer in a reactor at a high temperature such as 1050° C which will anneal the substrate (See Paragraph [0071]).
- Dwilinski also discloses a buffer layer/nucleation layer can be formed on substrate in which the GaN layer and subsequent layers can be grown from (See Claim 6).
- Lastly the temperature is reduced to 700° C after the layers have been formed under a nitrogen atmosphere (See Paragraph [0081]).

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Regarding claims 12, 17-19, 26, 31-33, & 35-36, Takeuchi further disclose:

- The quantum well width has width range of between 0.5 nm-10nm, which is equivalent to 5-100 Angstroms (See Fig. 6), therefore the well width can be greater 40 angstroms.

It would have been obvious to those having ordinary skill in the art at the time of invention to incorporate the teachings of Takeuchi with that of Dwilinski because by having the quantum well width of more than 40 angstroms serve to increase the light generation efficiency of the non-polar A-plane quantum well (See Fig. 6 & Col. 4, Lines 25-34). Further although Takeuchi does not disclose the quantum well has an optimal width of 52 angstroms, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 13-14 & 27-28, Dwilinski further discloses:

- The active layer is made of the quantum well layers and barrier layers, wherein the barrier are doped with silicon (See Paragraph [0077]).

Regarding claims 24 & 34, Dwilinski and Takeuchi disclose all of the limitations of claims 1 & 11 (addressed above). Although neither explicitly disclose the determining factors of the quantum well width, it would have been obvious to

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those having ordinary skill in the art to closely consider the material quality, interface roughness, and excitonic Bohr radius of the quantum well because these factors among others are key characteristics to forming a desired, reliable quantum well.

Claims 15 & 29 rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski (WIPO Publication 03/098757) with Dwilinski (Pre-Grant 2006/0138431) provide as an English translation in view of Takeuchi (US Patent 6,229,151) as applied to claims 14 & 26 above, and further in view of Nagahama (US Patent 6,677,619).

Regarding claims 15 & 29, Nagahama discloses a light emitting device comprising:

- A barrier layer doped with silicon, wherein the silicon concentration is $8 \times 10^{18} \text{ cm}^{-3}$ (See Col. 21, Lines 59-65).

It would have been obvious to those having ordinary skill in the art at the time of invention to incorporate the teachings of Nagahama with that of Dwilinski because the doping will decrease the threshold value (See Col. 22, Lines 1-2).

Claims 16 & 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski (WIPO Publication 03/098757) with Dwilinski (Pre-Grant 2006/0138431) provide as an English translation in view of Takeuchi (US Patent 6,229,151) as applied to claims 1 & 11 above, and further in view of Hata (US Patent 6,977,953).

Regarding claims 16 & 30, Hata discloses a light emitting device comprising:

- A quantum well wherein the quantum well can be GaN/AlGaN (See Col. 52, Lines 49-51).

It would have been obvious to those having ordinary skill in the art at the time of invention to incorporate the teachings of Hata with that of Dwilinski because the GaN/AlGaN quantum well structure will have a larger band gap than an InGaN quantum well structure (See Col. 52, Lines 49-51). Further the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of invention.

Response to Arguments

Applicant's arguments with respect to claims 1 , 10 & 11 have been considered but are moot in view of the new ground(s) of rejection. All rejections with regards to the new grounds of rejection have been addressed above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRANDON FOX whose telephone number is (571)270-5016. The examiner can normally be reached on Mon - Fri 6:30 - 5:00 EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on 571-272-1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BCF
10/04/2011

/DAVID VU/
Primary Examiner, Art Unit 2818

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